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AQUEOUS BINDER COMPOSITIONS BASED ON CURABLE LIQUID SYNTHETIC RESIN, CURING AGENT THEREFOR, HYDRAULIC CEMENT AND PLASTICIZING AGENT

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ABSTRACT OF THE DISCLOSURE

Plastic, aqueous binder compositions based on an ambient temperature curable liquid synthetic resin and an ambient temperature curing agent therefore, a hydraulic cement and sufficient water to cure the cement, and a plasticizing agent for the composition comprising an aqueous dispersion of (1) a film-forming carboxyl-containing polymer and (2) a six-membered carbocyclic compound having two vicinal carboyl substituents; which dispersions, after being dried, are redispersible in water.

Background of the Invention

Binder or "mortar" compositions of the type contemplated by the present invention, excluding the specific plasticizing agent described herein, are broadly disclosed in U.S. Pat. 3,240,736.

The prior known methods for preparing such compositions comprise preparation of a mixture of (a) cement, plasticizer (i.e., latex) and a separate mixture of (b) resin and curing agent, followed by prompt admixing of the separately formed mixes. Such process requires that the ingredients of the binder composition be supplied to the user as a four-package system, i.e., individual packages of cement, plasticizer, resin and curing agent. Heretofore, these ingredients could not be premixed and stored without adversely affecting the binder properties. It is the primary object of the present invention to provide binder compositions having excellent adhesive properties by a means wherein the ingredients thereof may be premixed and supplied to the user as a two-package system.

Summary of the Invention

The above and related objects are attained using a binder composition comprising a mixture of the following in parts by weight of solids; from about 20 to about 85 hydraulic cement, from about 10 to about 50 liquid synthetic thermosetting ambient temperature curable resin and an ambient temperature curing agent therefor, and from about 2 to about 25 of a polymeric latex plasticizer for the composition comprising an aqueous dispersion of particles of a copolymer of from about 1 percent to about 10 percent of an α,β-ethylenically unsaturated carboxylic acid and the balance of a polymerizable, essentially water-insoluble, ethylenically unsaturated monomeric composition and an effective amount to provide water redispersibility of a six-membered carbocyclic compound having two vicinal carboxyl substituents; said copolymer being film forming at temperatures below about 95° C.

The invention further encompasses processes for forming such compositions wherein the ingredients may be premixed and supplied to the user as two-package systems without detriment to binder effectiveness. Such processes comprise (a) separately preparing a mixture of a blend of cement, resin and the dried solids of the plasticizing latex and thereafter admixing the same with curing agent and water, or (b) preparing a first mixture comprising a blend of cement, curing agent and dried latex solids and thereafter admixing the same with said resin and water.

Description of the Preferred Embodiments

Typical ambient temperature curable resins, and curing agents therefore, are those as described in U.S. Pat. 3,240,736, issued Mar. 15, 1966, with the epoxy resins and their conventional curing agents being preferred.

The hydraulic cement employed in the present invention can be the conventional hydraulic cements such as Portland cement; La Farge, a grappier derived from hydraulic lime; lime; Roman cement, a cement made by heating clay and limestone; blast furnace slag cement; Keene's cement, which is a form of dehydrated gypsum with small amounts of accelerators such as alum or potassium sulfate added; conventional gypsum; plaster of Paris; calcium aluminate; pozzolana, a natural cement; and the like which when mixed with water, set or cure to form a solid rigid mass. It will be understood that the foregoing do not all act in an identical manner. For example, conventional gypsum sets quite rapidly as compared to Portland cement, and while these two do not per se form solids of the same bond strength, they both produce strong bonds and high strength in the compositions of the present invention. Conventional accelerators and retarding agents for the various cements can also be added.

It will be understood that in each instance where the hydraulic cements are employed in the present invention, sufficient water is added to completely hydrate and cure the cement. Some or all of the necessary water may be derived from some of the other composition components, for example, from the plasticizers when they are employed in the form of aqueous emulsions, i.e., the rubber latices.

Other nonreactive organic and inorganic fillers and modifiers such as asbestos, hollow phenolic spheres known as microballoons, carbon blacks, talcs, calcium carbonates, glass fibers, sand, micas, wood flour, clays, silicas, barytes, aluminum oxides, zinc oxides, lead oxides, titanium dioxides, and liquid-solid dispersions such as asbestos in water, lead oxides in glycerin, silicas in waterglass, barytes in waterglass, calcium carbonates in waterglass, etc., can be added to or used as a partial replacement of the above mentioned hydraulic cements. These modifiers are added to increase bulk, reduce cost, add thixotrophy, or other specific properties. Partial replacement can be made with these modifiers where ultimate strength is not as important as cost, viscosity, thixotropy, bulk, etc. or when the present compositions are used as caulking or sealing materials.

The plasticizing agent for the composition contains a mixture of a film-forming copolymer and a six-membered carbocyclic compound having two vicinal carboxyl substituents and are prepared either by the addition of such a carbocyclic compound to a preformed latex or by the in situ preparation of the carbocyclic compound and the copolymer comprising the latex by an emulsion polymerization process. For brevity, the methods are sometimes referred to hereinafter as the "additive method" when the carbocyclic compound per se is added either before, during, or after polymerizing the monomeric components of the latex and as the "in situ method" when the carbocyclic compound is formed during emulsion polymerization.

The six-membered carbocyclic compounds having two vicinal carboxyl substituents, i.e., compounds containing a ring composed of six carbon atoms having one carboxyl group attached to each of two adjacent ring-carbon atoms, are represented by phthalic acid, 1,2,3,6-tetrahydrophthalic acid and hexahydrophthalic acid. These compounds are phthalic acid and phthalic acid derivatives having different degrees of saturation; e.g., phthalic acid is completely unsaturated, hexahydrophthalic acid is completely saturated whereas 1,2,3,6-tetrahydrophthalic acid has an intermediate degree of saturation. The term "six-mem-